WHAT IS CLAIMED IS:

1. An image forming apparatus, comprising:

a program obtaining part for sending a screen

5   data for inputting a program to a client terminal, and

receiving the program from the client terminal; and

a program execution part for executing the

program received by the program obtaining part.

10

2. An image forming apparatus, comprising:

an operation display part for displaying a

15   screen and inputting information;

a program obtaining part for displaying a

screen on the operation display part for inputting a

program and obtaining the program input from the

operation display part; and

20   a program execution part for executing the

program obtained by the program obtaining part.

25

3. The image forming apparatus as claimed in claim 1, wherein the program obtaining part includes a Web server capability, and the image forming apparatus sends a html file as the screen data to the client

5 terminal according to access from the client terminal.

10 4. The image forming apparatus as claimed in claim 3, wherein the image forming apparatus detects an event from the client terminal and executes a CGI program corresponding to the event.

15

5. The image forming apparatus as claimed in claim 1, wherein, when the program is executed in the

20 image forming apparatus, the image forming apparatus causes the client terminal to display a screen same as a screen displayed on a display part of the image forming apparatus.

25

6. The image forming apparatus as claimed in claim 1, wherein the image forming apparatus associates

5   a key with the program according to a request from the client terminal or an operation display part of the image forming apparatus, and stores a table including correspondence between the program and the key.

10

7. The image forming apparatus as claimed in claim 6, wherein the image forming apparatus detects

15   input of the key, and executes the program corresponding to the key by referring to the table.

20

8. The image forming apparatus as claimed in claim 6, the image forming apparatus displays a key assigning screen for assigning a key to the program, and assigns a key to a program according to input from

25   the key assigning screen.

5   9. The image forming apparatus as claimed in claim 1, wherein the image forming apparatus executes the program for testing operation of the program.

10

     10. The image forming apparatus as claimed in claim 1, the image forming apparatus further comprising a part for accessing a server that stores programs and

15   downloading a program from the server.

20   11. The image forming apparatus as claimed in claim 1, wherein the program execution part is an interpreter.

25

12. The image forming apparatus as claimed in claim 1, the image forming apparatus further comprising:

5   hardware resources used for image forming processing;

control services existing between the hardware resources and an application in the image forming apparatus;

10   wherein the program operates as the application.

15

13. The image forming apparatus as claimed in claim 12, wherein the program performs function call to the control services by using the program execution part.

20

14. A program execution method in an image 25 forming apparatus, the program execution method

comprising the steps of:

sending a screen data for inputting a program to a client terminal;

receiving the program from the client

5   terminal; and

executing the program received from the client terminal.

10

15. A program execution method in an image forming apparatus, the program execution method comprising the steps of:

15   displaying a screen on an operation display part in the image forming apparatus for inputting a program;

obtaining the program input from the operation display part; and

20   executing the program obtained by the program obtaining part.

25

16. The program execution method as claimed
in claim 14, wherein the image forming apparatus sends
a html file as the screen data to the client terminal
according to access from the client terminal.

5

17. The program execution method as claimed
in claim 16, wherein the image forming apparatus
detects an event from the client terminal and executes
a CGI program corresponding to the event.

10

15

18. The program execution method as claimed
in claim 14, wherein, when the program is executed in
the image forming apparatus, the image forming
apparatus causes the client terminal to display a
screen same as a screen displayed on a display part of
the image forming apparatus.

20

25

19. The program execution method as claimed in claim 14, wherein the image forming apparatus associates a key with the program according to a

5   request from the client terminal or an operation display part of the image forming apparatus, and stores a table including correspondence between the program and the key.

10

20. The program execution method as claimed in claim 19, wherein the image forming apparatus

15   detects input of the key, and executes the program corresponding to the key by referring to the table.

20

21. The program execution method as claimed in claim 19, the image forming apparatus displays a key assigning screen for assigning a key to the program, and assigns a key to a program according to input from

25   the key assigning screen.

5   22. The program execution method as claimed

in claim 14, the image forming apparatus comprising:

          hardware resources used for image forming

processing;

          control services existing between the

10   hardware resources and an application in the image

forming apparatus;

          wherein the program operates as the

application.

15

          23. A program causing an image forming

apparatus to obtain an application program, the program

20   comprising:

          program obtaining program code means for

sending a screen data for inputting an application

program to a client terminal, and receiving the

application program from the client terminal.

25

24. A program for casing an image forming

5   apparatus to obtain an application program, wherein the

image forming apparatus comprising an operation display

part for displaying a screen and inputting information,

the program comprising:

program obtaining program code means for

10   displaying a screen on the operation display part for

inputting an application program and obtaining the

application program input from the operation display

part.

15

25. The program as claimed in claim 23,

wherein the program obtaining program code means

20   includes a Web server capability, and causes the image

forming apparatus to send a html file as the screen

data to the client terminal according to access from

the client terminal.

25

26. The program as claimed in claim 23, the program further comprising program code means for

5 causing the client terminal to display a screen same as a screen displayed on a display part of the image forming apparatus when the application program is executed in the image forming apparatus.

10

27. The program as claimed in claim 23, the program further comprising program code means for

15 accessing a server that stores programs and downloading a program from the server.

20

28. A computer readable recording medium storing a program causing an image forming apparatus to obtain an application program, the program comprising:

program obtaining program code means for

25 sending a screen data for inputting an application

program to a client terminal, and receiving the

application program from the client terminal.

5

29. An information processing apparatus used

for developing a program to be executed on an image

forming apparatus, the information processing apparatus

10 comprising:

an execution part for interpreting and

executing the program;

an emulator for causing the information

processing apparatus to perform processing

15 corresponding to that to be performed by the image

forming apparatus according to instructions of the

program.

20

30. The information processing apparatus as

claimed in claim 29, wherein the execution part is a

virtual machine.

25

31. The information processing apparatus as claimed in claim 30, the information processing apparatus further comprising a compiler for converting source code of the program to code executable by the virtual machine.

32. The information processing apparatus as claimed in claim 31, wherein the program is a Java program and the information processing apparatus further comprises a class library to be referred to by the Java program.

33. The information processing apparatus as claimed in claim 29, wherein the emulator causes the information processing apparatus to display a screen corresponding to an operation panel of the image

forming apparatus.

5

    34. The information processing apparatus as claimed in claim 29, wherein the emulator causes the information processing apparatus to display a list of programs and execute a program selected by the user.

10

    35. The information processing apparatus as

15 claimed in claim 29, wherein the emulator causes the information processing apparatus to print data to a printer connected to the information processing apparatus for a print instruction.

20

    36. The information processing apparatus as claimed in claim 29, the information processing

25 apparatus further comprising a sending part for sending

a program.

5

37. The information processing apparatus as claimed in claim 36, wherein the sending part sends the program to a server that stores programs.

10

38. The information processing apparatus as claimed in claim 36, wherein the sending part receives

15   a screen data for inputting a program and sends the program to the image forming apparatus by using the screen data.

20

39. A program for casing an information processing apparatus to emulate an image forming apparatus, wherein the information processing apparatus

25   is used for developing an application program to be

executed on the image forming apparatus, the program comprising:

emulator program code means for causing the information processing apparatus to perform processing

5   corresponding to that to be performed by the image forming apparatus according to instructions of the application program.

10

40. The program as claimed in claim 39, the program further comprising execution program code means for interpreting and executing the application program.

15

41.   The program as claimed in claim 40,

20   wherein the execution program code means is a virtual machine.

25

42. The program as claimed in claim 41, the program further comprising a compiler for converting source code of the application program to code executable by the virtual machine.

5

43. The program as claimed in claim 42,

10 wherein the application program is a Java program and the program further comprises a class library to be referred to by the Java program.

15

44. The program as claimed in claim 39, wherein the emulator program code means causes the information processing apparatus to display a screen

20 corresponding to an operation panel of the image forming apparatus.

25

45. The program as claimed in claim 39, wherein the emulator program code means causes the information processing apparatus to display a list of application programs and execute an application program

5   selected by the user.

10   46. The program as claimed in claim 39, wherein the emulator program code means causes the information processing apparatus to print data to a printer connected to the information processing apparatus according to a print instruction.

15

47. The program as claimed in claim 39, the

20   program further comprising sending program code means for sending an application program.

25

48. The program as claimed in claim 47, wherein the sending program code means causes the information processing apparatus to send the application program to a server that stores application

5   programs.

10   49. The program as claimed in claim 47, wherein the sending program code means causes the information processing apparatus to receive a screen data for inputting an application program and sends the application program to the image forming apparatus by

15   using the screen data.

20   50. A program, to be executed on an image forming apparatus, developed by using an information processing apparatus, the information processing apparatus comprising:

       an execution part for interpreting and

25   executing the program;

an emulator for causing the information
processing apparatus to perform processing
corresponding to that to be performed by the image
forming apparatus according to instructions of the
5   program.

10   51. A computer readable medium storing a
program for casing an information processing apparatus
to emulate an image forming apparatus, wherein the
information processing apparatus is used for developing
an application program to be executed on the image
15   forming apparatus, the program comprising:
            emulator program code means for causing the
information processing apparatus to perform processing
corresponding to that to be performed by the image
forming apparatus according to instructions of the
20   application program.

25   52. An image forming apparatus that includes

service modules for performing system side processing

on image formation, wherein applications can be added

to the image forming apparatus separately from the

service modules, the image forming apparatus

5   comprising:

a virtual machine for executing an

application; and

an application management part for managing

the application executed by the virtual machine.

10

53. The image forming apparatus as claimed in

15   claim 52, the image forming apparatus comprising an

interpreter instead of the virtual machine.

20

54. The image forming apparatus as claimed in

claim 52, wherein the application is a Java program and

the image forming apparatus includes a class library to

be referred to by the Java program.

25

55. The image forming apparatus as claimed in
5   claim 54, wherein the class library includes classes

for displaying data on a display part of the image

forming apparatus.

10

56. The image forming apparatus as claimed in

claim 52, wherein the application management part is a

loader for loading the application into the image

15 forming apparatus from a recording medium to be

connected to the image forming apparatus or from a

server to be connected to the image forming apparatus

via a network.

20

57. The image forming apparatus as claimed

in claim 56, wherein the loader determines whether an

25 application is already loaded in the image forming

apparatus, executes the application if the application
is loaded, and displays a loader screen if the
application is not loaded.

5

58. The image forming apparatus as claimed in
claim 56, wherein the loader displays an application

10   load screen on a display part of the image forming
apparatus and downloads an application from a location
specified by the user on the load screen.

15

59. The image forming apparatus as claimed in
claim 58, wherein the loader displays a list of
applications and downloads an application selected from

20   the list by the user.

25   60. The image forming apparatus as claimed in

claim 58, wherein the location is a Web server or a FTP server that stores applications.

5

61. The image forming apparatus as claimed in claim 58, wherein the loader checks, at predetermined intervals, whether an application corresponding to the
10 downloaded application is updated in the location.

15 62. The image forming apparatus as claimed in claim 61, wherein the loader displays a screen for inputting the interval on a display part of the image forming apparatus and sets the interval according to input by the user.

20

63. The image forming apparatus as claimed in
25 claim 52, the image forming apparatus further

comprising:

a connecting part for connecting applications and causing the image forming apparatus to perform a series of processes according to the connected

5   applications.

10   64. The image forming apparatus as claimed in claim 63, wherein the connecting part displays, on a display part of the image forming apparatus, a first application and a plurality of applications that are candidates to be connected to the first application,

15 and connects an application selected from among the plurality of applications to the first application.

20

65. A program to be executed in an image forming apparatus that includes service modules for performing system side processing on image formation, wherein applications can be added to the image forming

25 apparatus separately from the service modules, the

program comprising:

virtual machine program code means for executing an application; and

application management program code means for

5   managing the application executed by the virtual

machine program code means.

10

66. The program as claimed in claim 65, the

program comprising interpreter program code means for

interpreting and executing the application instead of

the virtual machine program code means.

15

67. The program as claimed in claim 65,

20   wherein the application is a Java program and the

program includes a class library to be referred to by

the Java program.

25

68. The program as claimed in claim 67,
wherein the class library includes classes for
displaying data on a display part of the image forming
5   apparatus.

10   69. The program as claimed in claim 65,
wherein the application management program code means
is loader program code means for loading the
application into the image forming apparatus from a
recording medium to be connected to the image forming
15   apparatus or from a server to be connected to the image
forming apparatus vià a network.

.20

70. The program as claimed in claim 65,
wherein the loader program code means determines
whether an application is already loaded in the image
forming apparatus, executes the application if the
25   application is loaded, and displays a loader screen if

the application is not loaded.

5

71. The program as claimed in claim 65, wherein the loader program code means displays an application load screen on a display part of the image forming apparatus and downloads an application from a

10   location specified by the user.

15   72. The program as claimed in claim 71, wherein the loader program code means displays a list of applications on a display part of the image forming apparatus and downloads an application selected from the list by the user.

20

73. The program as claimed in claim 71, 25   wherein the location is a Web server or a FTP server

that stores applications.

5

74. The program as claimed in claim 71,
wherein the loader program code means checks, at
predetermined intervals, whether an application
corresponding to the downloaded application is updated
10 in the location.

15   75. The program as claimed in claim 74,
wherein the loader program code means displays a screen
for inputting the interval on a display part of the
image forming apparatus and sets the interval according
to input by the user.

20

76. The program as claimed in claim 65, the
25 program further comprising:

connecting program code means for connecting applications and causing the image forming apparatus to perform a series of processes according to the connected applications.

5

77. The program as claimed in claim 76,

10 wherein the connecting program code means displays, on a display part of the image forming apparatus, a first application and a plurality of applications that are candidates to be connected to the first application, and connects an application selected from among the

15 plurality of applications to the first application.

20 78. A computer readable medium storing a program to be executed in an image forming apparatus that includes service modules for performing system side processing on image formation, wherein applications can be added to the image forming

25 apparatus separately from the service modules, the

program comprising:

virtual machine program code means for
executing an application; and

application management program code means for

5   managing the application executed by the virtual

machine program code means.

10

79. An application execution method in an
image forming apparatus that includes a virtual machine
for executing an application and an application
management part for managing the application executed

15   by the virtual machine, the method comprising the steps

of:

displaying an application load screen on a
display part of the image forming apparatus;

downloading an application from a location

20   specified by the user; and

executing the application by using the
virtual machine.

25

80. The application execution method as claimed in claim 79, wherein the image forming apparatus includes an interpreter instead of the

5   virtual machine.

10   81. The application execution method as claimed in claim 79, wherein the location is a recording medium to be connected to the image forming apparatus or a server to be connected to the image forming apparatus via a network.

15

           82. The application execution method as

20   claimed in claim 79, wherein the image forming apparatus displays a list of applications and downloads an application selected from the list by the user.

25

83. An information processing apparatus, comprising a utility library that is implemented in a program;

5   wherein the program includes nested modules in which each module is based on a state transition model,

wherein, in the state transition model, operation of the program is determined according to a

10   first state of the program, an event for the program in the state, an event function to be executed when the event occurs in the state, and a second state transferred from the first state after the event function is executed,

15   wherein the utility library includes a state transition model launch function that assigns areas each for a module to a shared variable shared by the modules.

20

84. The information processing apparatus as claimed in claim 83, wherein the each area is specified

25   by a pointer in a stack area.

5   85. The information processing apparatus as

claimed in claim 83, wherein the state transition model

launch function assigns areas each for a thread to a

shared variable shared by threads.

10

          86. The information processing apparatus as

claimed in claim 83, wherein the state transition model

15   launch function executes an entry function that defines

processing performed when state transition occurs in

the state transition model.

20

          87. The information processing apparatus as

claimed in claim 83, wherein the state transition model

launch function executes a standard function that

25   defines processing performed when an asynchronous event

that occurs irrespective of the state occurs.

5

88. The information processing apparatus as
claimed in claim 83, wherein the information processing
apparatus is an image forming apparatus.

10

89. The information processing apparatus as
claimed in claim 88, the information processing
15 apparatus further comprising:

hardware resources used for image forming
processing;

control services that provide services to
applications in the image forming apparatus, in which
20 the services includes control of hardware resources;

wherein the program is an application in the
image forming apparatus, and the utility library is
linked to the application.

25

90. A program producing method, comprising a
link step of linking a utility library with a program;

5   wherein the program includes nested modules
in which each module is based on a state transition
model,

        wherein, in the state transition model,
operation of the program is determined according to a

10   first state of the program, an event for the program in
the state, an event function to be executed when the
event occurs in the sate, and a second state
transferred from the first state after the event
function is executed,

15   wherein the utility library includes a state
transition model launch function that assigns areas
each for a module to a shared variable shared by the
modules.

20

91. The method as claimed in claim 90,
wherein the each area is specified by a pointer in a

25   stack area.

5   92. The method as claimed in claim 90,

wherein the state transition model launch function

assigns areas each for a thread to a shared variable

shared by threads.

10

          93. The method as claimed in claim 90,

wherein the state transition model launch function

15   executes an entry function that defines processing

performed when state transition occurs in the state

transition model.

20

          94. The method as claimed in claim 90,

wherein the state transition model launch function

executes a standard function that defines processing

25   performed when an asynchronous event that occurs

irrespective of the state occurs.

5

95. The method as claimed in claim 90,
wherein the program produced according to the method is
a program to be executed in an image forming apparatus.

10

96. The method as claimed in claim 95, the
information processing apparatus further comprising:

15   hardware resources used for image forming
processing;

control services that provide services to
applications in the image forming apparatus, in which
the services includes control of hardware resources;

20   wherein the program is an application in the
image forming apparatus.

25

97. A state transition model in a program in which operation of the program is determined according to a first state of the program, an event for the program in the state, an event function to be executed

5   when the event occurs in the state, and a second state transferred from the first state after the event function is executed,

wherein the state transition model is used in an information processing apparatus including a utility

10   library that is implemented in the program;

wherein the program includes nested modules in which each module is based on the state transition model,

wherein the utility library includes a state

15   transition model launch function that assigns areas, each of which areas is for a module, to a shared variable shared by the modules.

20

98. A program produced by a program producing method, the method comprising a link step of linking a utility library with a program;

25   wherein the program includes nested modules

in which each module is based on a state transition
model,

wherein, in the state transition model,
operation of the program is determined according to a

5   first state of the program, an event for the program in
the state, an event function to be executed when the
event occurs in the state, and a second state
transferred from the first state after the event
function is executed,

10   wherein the utility library includes a state
transition model launch function that assigns areas
each for a module to a shared variable shared by the
modules.

15

99. A program for causing an information
processing apparatus to generate nested modules in
20   which each module is based on a state transition model,
wherein, in the state transition model,
operation of the program is determined according to a
first state of the program, an event for the program in
the state, an event function to be executed when the
25   event occurs in the state, and a second state

transferred from the first state after the event

function is executed, the program comprising:

program code means that assigns areas each

for a module to a shared variable shared by the modules

5   in response to receiving a message; and

program code means for executing the event

function corresponding to the message by referring to

an event function table.

10

100. The program as claimed in claim 99, the

program further comprising program code means for

15   executing an entry function that defines processing

performed when state transition occurs in the state

transition model.

20

101. The program as claimed in claim 99, the

program further comprising program code means for

executing a standard function that defines processing

25   performed when an asynchronous event that occurs

irrespective of the state occurs.

5

102. The program as claimed in claim 99, wherein the information processing apparatus is an image forming apparatus.

10

103. The program as claimed in claim 102, the information processing apparatus further comprising:

15   hardware resources used for image forming processing;

control services that provide services to applications in the image forming apparatus, in which the services includes control of hardware resources;

20   wherein the program is an application in the image forming apparatus.

25

104. A computer readable medium storing a program produced by a program producing method, the method comprising a link step of linking a utility library with a program;

5   wherein the program includes nested modules in which each module is based on a state transition model,

wherein, in the state transition model, operation of the program is determined according to a

10   first state of the program, an event for the program in the state, an event function to be executed when the event occurs in the state, and a second state transferred from the first state after the event function is executed,

15   wherein the utility library includes a state transition model launch function that assigns areas each for a module to a shared variable shared by the modules.

20

105. A computer readable medium storing a program for causing an information processing apparatus

25   to generate nested modules in which each module is

based on a state transition model,

wherein, in the state transition model, operation of the program is determined according to a first state of the program, an event for the program in
5   the state, an event function to be executed when the event occurs in the state, and a second state transferred from the first state after the event function is executed, the program comprising:

program code means that assigns areas each
10   for a module to a shared variable shared by the modules in response to receiving a message; and

program code means for executing the event function corresponding to the message by referring to an event function table.

15

20

25